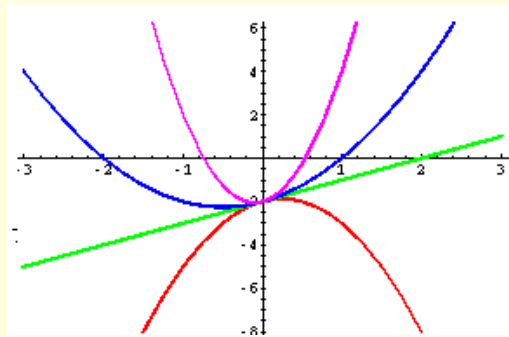


9.3 Graphing Quadratic Functions



GRAPH OF A QUADRATIC FUNCTION

The graph of $y = ax^2 + bx + c$ is a parabola.

- If a is positive, the parabola opens up.
- If a is negative, the parabola opens down.
- The vertex has an x-coordinate of $-\frac{b}{2a}$.
- The axis of symmetry is the vertical line $x = -\frac{b}{2a}$.

$$-\frac{b}{2a}$$

GRAPHING A QUADRATIC FUNCTION

- STEP 1** Find the x -coordinate of the vertex. Then find the y -coordinate
- STEP 2** Make a table of values, using x -values to the left and right of the vertex (5 points)
- STEP 3** Plot the points and connect them with a smooth curve to form a parabola.

LOTS O' Vocab!

A **quadratic function** is a function that can be written in the **standard form**

$$y = ax^2 + bx + c, \text{ where } a \neq 0.$$

Every quadratic function has a U-shaped graph called a **parabola**.

The **vertex** is the lowest point of a parabola that opens up and the highest point of a parabola that opens down.

The line passing through the vertex that divides the parabola into two symmetric parts is called the **axis of symmetry**. The two symmetric parts are mirror images of each other.

Sketch the graph of $y = x^2 - 2x - 3$

$$a = 1 \quad b = -2 \quad c = -3$$

$$x = \frac{-b}{2a}$$

Step 1: Find the x and y coordinates of the vertex

$$x = \frac{+2}{2 \cdot 1} = \frac{2}{1} = 1$$

x- coordinate

$$y = (1)^2 - 2(1) - 3$$

$$y = 1 - 2 - 3$$

$$y = -4$$

$$(1, -4)$$

y- coordinate

Vertex

$$1.0.5 = x = 1$$

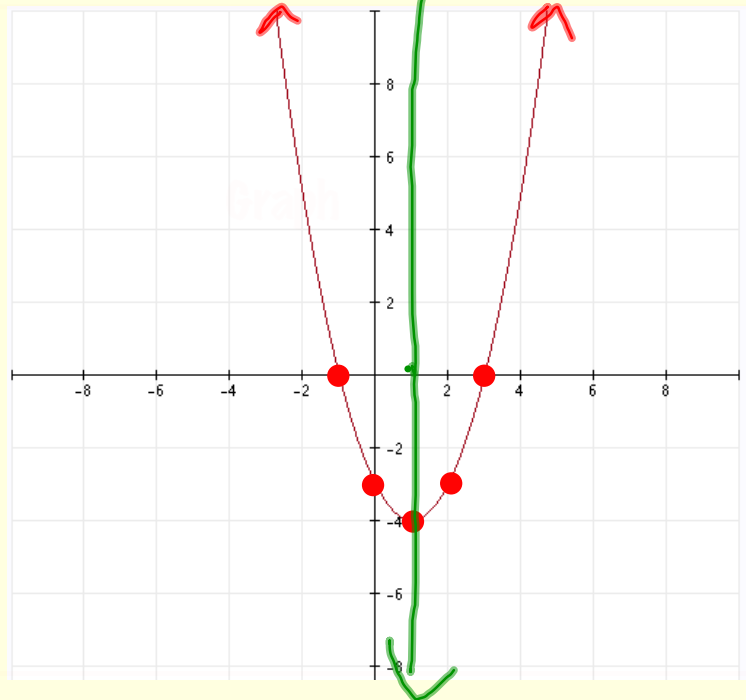
Step 2: Make a table of values

| x | y |
|----|----|
| -1 | |
| 0 | |
| 1 | -4 |
| 2 | |
| 3 | |

Vertex goes
in
the middle

Table
of
values

Step 3: Plot the points and connect with a smooth curve



Graph

2. $y = x^2$

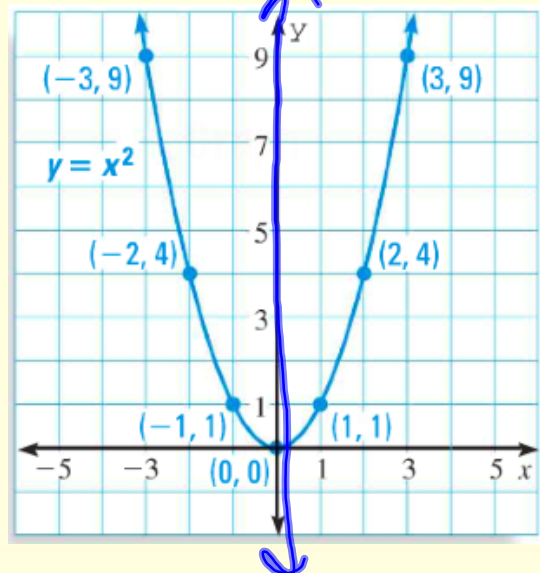
$a = 1$ $b = 0$

L.O.S $\boxed{x = 0}$

$c = 0$

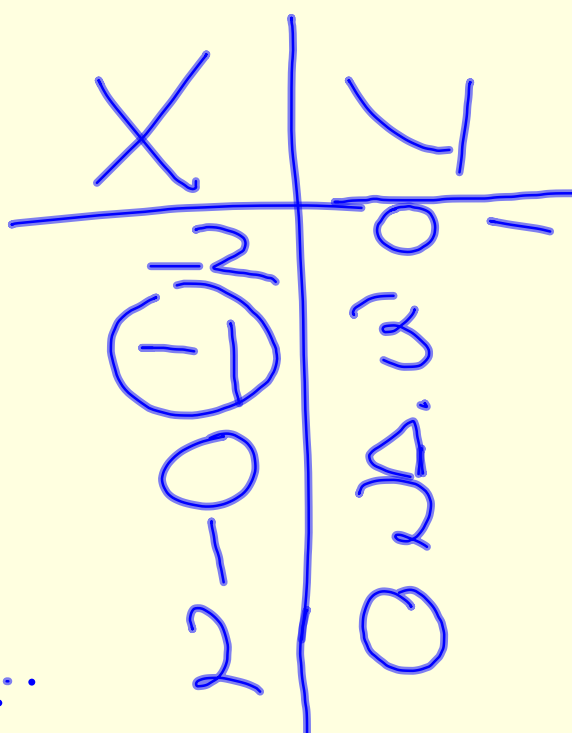
$$\frac{-b}{2a} = \frac{-0}{2(1)} = 0$$

| X | Y |
|----|---|
| -3 | 9 |
| -2 | 4 |
| -1 | 1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 4 |
| 3 | 9 |



3. $y = -x^2 + 4$

$(0, 4)$

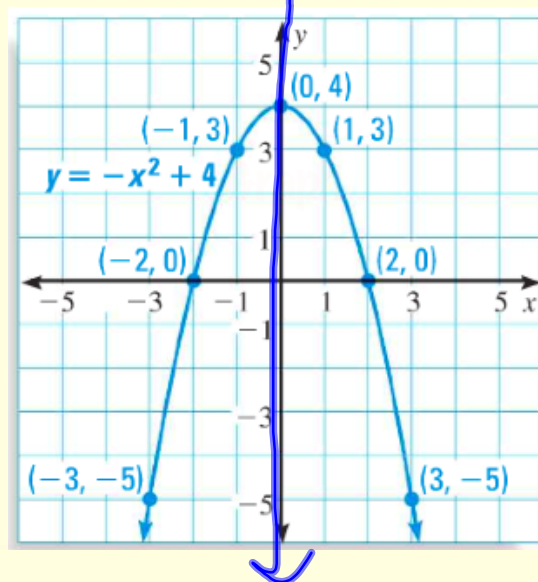


∴

$$y = -(-1)^2 + 4$$

$$-1 + 4$$

$$y = 3$$



How do a , b , and c change a quadratic equation?

What happens as ' a ' gets larger or smaller? What happens when a is zero?

What happens as ' b ' changes?

What happens as ' c ' changes?